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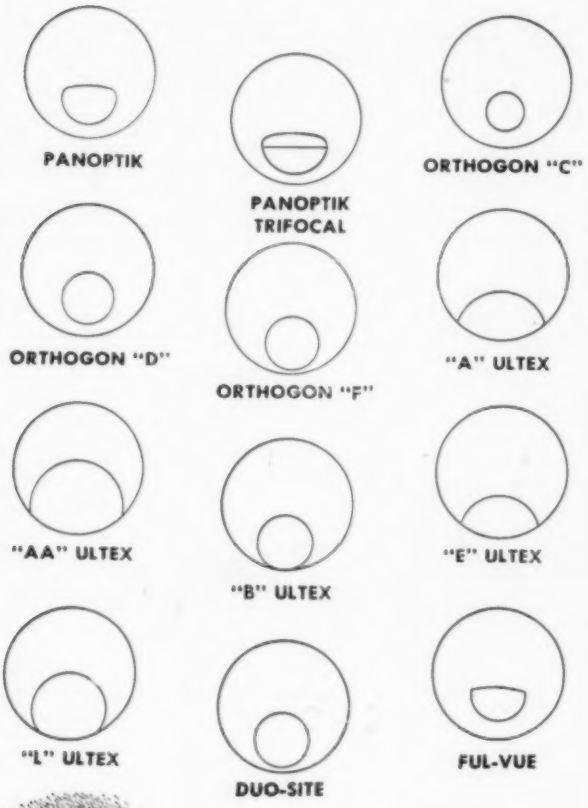

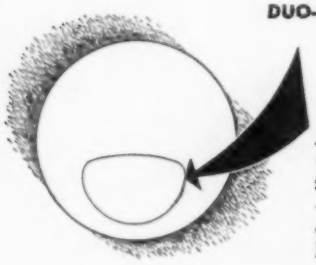

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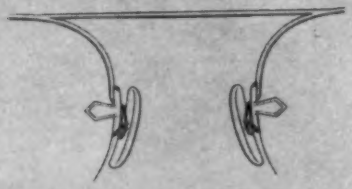

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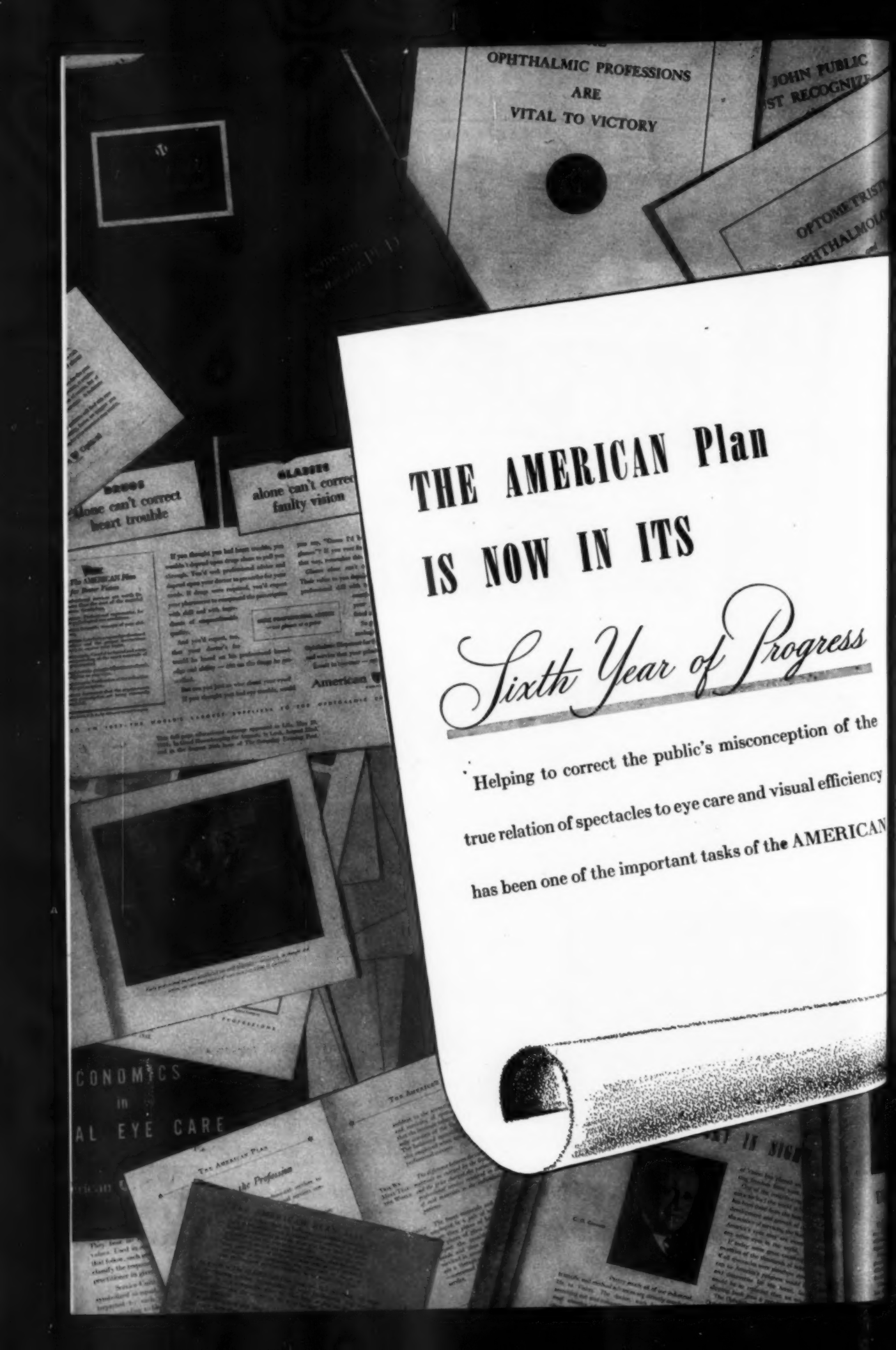
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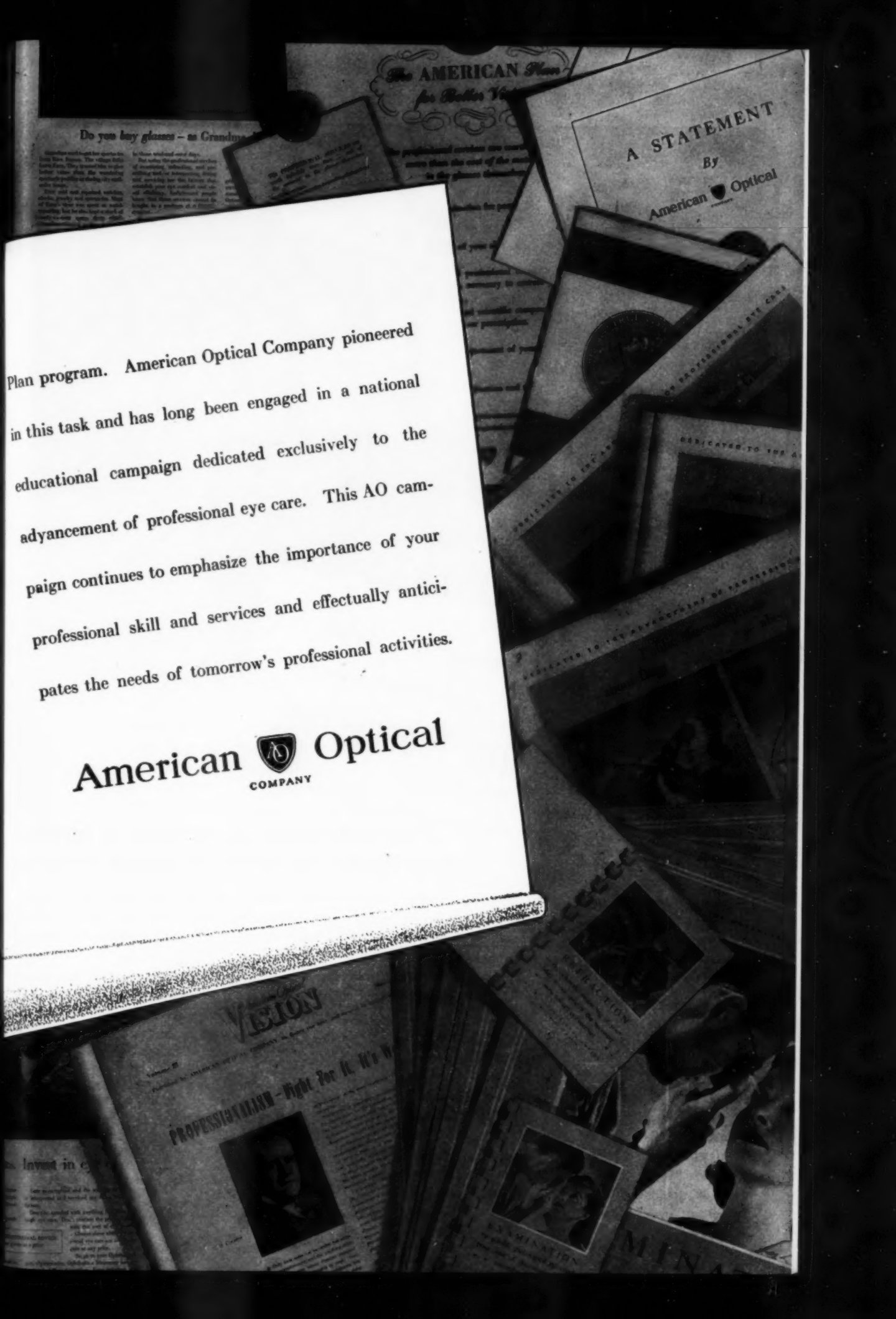
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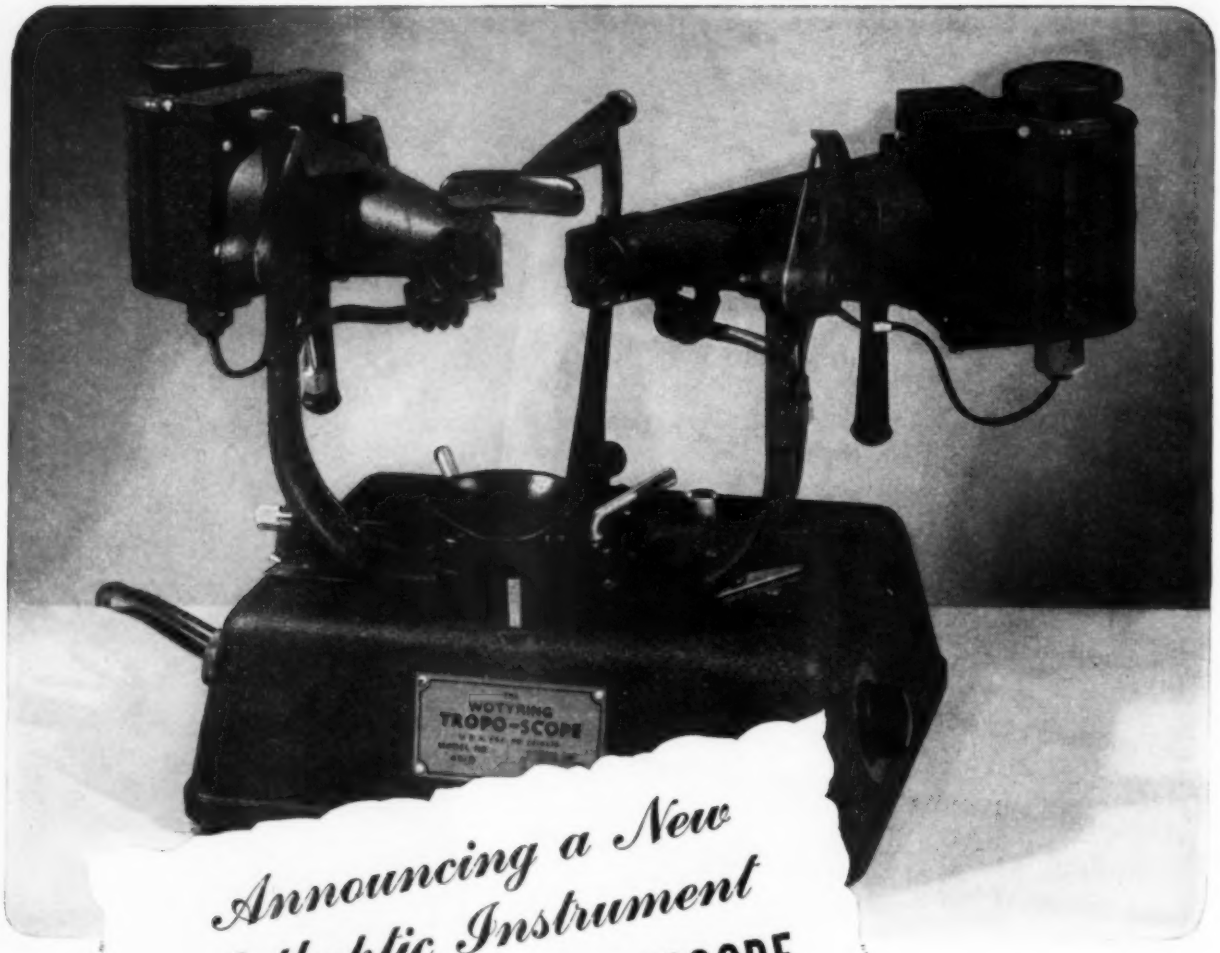

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A STUDY OF ASTIGMATISM AT THE NEAR POINT WITH SPECIAL REFERENCE TO ASTIGMATIC ACCOMMODATION *

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Hanover, New Hampshire

The present-day refractionist is giving increasingly more attention to findings obtained when the patient's fixation is at or within arm's length. Studies made in industries, schools and business offices have emphasized the need for more attention to visual problems at the near point. The determination of the amount and axis of astigmatism is about the only test made for distance fixation but neglected at the near point.

That the amount and/or axis of the astigmatism at the near point is frequently different from that found at distance, has been pointed out occasionally by a few who have taken the trouble to measure patients' astigmatism at both distance and near. Some of these reports will be discussed later. Others have shown by calculations that differences between the distance and near astigmatism might be expected. Most of the factors that are likely to cause differences between distance and near astigmatic findings can be summarized as follows:

1. Sectional changes in the crystalline lens in accommodation.
2. The change in effective power of correcting lenses due to distance of the lenses from the eyes and amount of accommodation.
3. Variations in the size of the pupils during the different tests—introducing various peripheral aberrations.
4. Subjective selection by the patient of different sections of the

* Read before the Twenty-second Annual Meeting of the American Academy of Optometry, on December 9, 1945, at Columbus, Ohio. For publication in the February, 1946, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

† Optometrist. Fellow of American Academy of Optometry.

image ray bundle may differ, depending on the distance, the nature of the test object, and the accommodation.

5. Cyclotorsion or rotation of the eyeball as a whole.
6. In binocular vision, a "fusional compensation" may occur—which results in a slight shift of axis.
7. The action of the extrinsic muscles in near vision may change slightly the curves of the cornea.
8. Tilt, rotation, or other changes in the position of the crystalline lens.
9. Astigmatism by oblique incidence when looking away from the center of correcting lens.
10. The stenopaeic effect of partially closing the lids especially when looking below the primary position of gaze, as in reading.

Souter[1] in his book, "The Refractive and Motor Mechanism of the Eye," pointed out that Dobrowolsky in 1868 was the first to announce the hypothesis that astigmatism may be influenced by a partial or asymmetrical contraction of the ciliary muscle. If this were so, it would mean that the amount of astigmatism would vary depending on whether or not accommodation was exerted, that is, whether or not the fixation distance was near by or far away. Also Javal[1] assigned meridional lenticular changes as an important factor in the difference between the keratometric findings and the subjective astigmia. However, Hess[1] undertook the following experiment to determine whether or not meridional accommodation was possible. The apparatus consisted of two cotton threads stretched at right angles to each other and mounted on supports which could be moved along a graduated rod. The astigmatism (natural or induced by lenses) of the subject being known, the vertical thread was placed at the near-point of the horizontal meridian of the eye, while the horizontal thread was placed at the near-point of the vertical meridian. By moving one of the threads, the power of the eye to accommodate in one meridian could be ascertained. Hess examined 23 subjects in this manner and in not one case did he find an indication of what might be termed meridional accommodation, to exceed 0.37 D., and it was usually less than 0.10 D.; that is, as Souter states, "not that this amount of partial accommodation actually existed, but that it could not be excluded by the test."

Using the method of stigmatoscopy[2], I also tried to find evidence for an accommodative astigmatism, but I did not find differences in the amount nor axis of the near astigmatism as compared to the distance

findings that could be attributed unequivocally to astigmatic accommodation. Hess' method and the method of stigmatoscopy provide a more accurate measurement of the refraction in two principal meridians than is possible with targets or test charts consisting of letters or other objects the details of which are so gross as to make impossible a fine discrimination between perfectly sharp images and those formed with slight diffusion.

Some investigators who have studied this problem have concluded that there is a basis for accommodative astigmatism. They found that some patients preferred a different cylindrical correction at the near point, as compared to that for distance vision, when the test charts consisted of letters. The conclusion based upon these results is open to question. In the first place, letters do not constitute an exact test for astigmatism since it is well known that in order to be legible letters do not require the same clearness in the horizontal meridian as in the vertical. The fact that patients who have astigmatism with-the-rule are able to read more letters on the Snellen Chart than those who have the same amount of astigmatism against-the-rule, is an example of the greater importance of the vertical strokes, rather than the horizontal, in the recognition of letters. Furthermore, letters are so gross and so familiar that exact conjugate focus, either spherical or meridional, is not necessary for simple discrimination.

Regarding the claims made for meridional lenticular changes, Duke-Elder[3] has stated in his "Textbook of Ophthalmology" published in 1940:

> "There is no scientific foundation for such a claim. . . . All the evidence goes to show that if any part of the cilary muscle contracts in life, it contracts equally all around. . . ."

Nevertheless, in 1943 Morgan, Mohney and Olmstead[4] published the results of their investigations on the nervous contol of the accommodation in certain animals. They reported that in 85% of their subjects an "accommodative astigmatism" occurred upon stimulation of the cervical sympathetic nerve, which averaged slightly over one diopter with-the-rule. It is debatable whether these observations on animals are applicable to human beings engaged in tasks rarely requiring more than 3 D. of accommodation. Although I do not doubt the accuracy of the experiments and the results obtained by Morgan and his associates, I am not prepared to accept their conclusion that the changes found can be explained by sectional accommodation only. It is not clear that they eliminated other possibilities such as the difference in the effectivity of the corrective lenses, the tilting of the crystalline lens, and the chance

that the stimulation to the cervical sympathetic nerve was not equally distributed to all its fibers.

Sheard[5] has recognized the *possibility* of accommodative astigmatism but one cannot infer that he accepted it as a fact. In the summary and conclusions of his study of dynamic skiametry, Sheard[5] mentioned:

> "The possibility of accommodative astigmatism, demonstrated by the fact that the astigmatic corrections at short fixation distances exceed those at twenty or more feet by from one-half to three-quarters of a diopter."

In the literature I have been able to find only one case which is unquestionably one of astigmatic accommodation. This is the report by Lancaster[6] in 1916 of a young woman, age 23, who had a severe illness due to food poisoning which affected the central nervous system, especially the eyes. The astigmatism of one eye varied from +0.75 D. Cyl. x 20 to +2.75 D. Cyl. x 80 over a period of six months, but under cycloplegia only +0.25 D. Cyl. x 90 was measured. Lancaster[6] concluded:

> " . . . It was natural to surmise that the change was due to a change in the action of the ciliary muscle. As the nuclear cells recovered from the damage by the toxin, some cells would recover better than others, and so the parts of the ciliary muscle under their control recover tone better than the other parts: from this would result an unequal tension on the suspensory ligament and a consequent unequal curvature of the anterior surface of the lens."

Lancaster pointed out that the conditions of his interesting case were "excessively pathologic." It is worth mentioning that Lancaster who has devoted more than fifty years to the study of refraction with special interest in astigmatism, does not believe[7] that astigmatic accommodation is the explanation for the differences found between distance and near astigmatic findings in non-pathological cases. Furthermore, Lancaster has demonstrated[8] in a practical and convincing way that it is not necessary to assume sectional lenticular changes in order to account for the ability of some people to compensate for their astigmatism or to explain the differences found on accommodation, because it is possible by a *spherical* adjustment of the crystalline lens to refocus an astigmatic bundle of rays in such a way as to have fall on the retina the circular section of the interval of Sturm and thereby make it seem as though the object-rays were non-astigmatic.

The above demonstration can be carried out very nicely by projecting an astigmatic dial onto a screen and adding in front of the projector a cylindrical lens of say 0.50 D., causing certain sections of the projected image of the astigmatic dial to be focused on the screen clearer than others. Then by adjusting the spherical focus of the projector it will be noticed that all the lines of the astigmatic chart can be made to

appear equally clear or equally blurred. A Snellen Chart can be substituted for the astigmatic dial and by projecting it, adding a cylindrical lens and refocussing the projector properly, it can be demonstrated that by a simple spherical change in the optical system there will be a non-astigmatic image and various degrees of an astigmatic image on either side of the best spherical focus. At this meeting I will demonstrate the phenomena mentioned above and those who have some type of a projector in their offices can duplicate easily the experiments described.

It should be obvious from what has been said so far, that while the possibility exists that a contraction of the ciliary muscle may in certain instances be more effective in one meridian than another, yet the assumption that meridional (astigmatic) accommodation accounts for all, or most, differences between distance and near astigmatic findings, is rather untenable. Nevertheless, it is worthwhile to review the two recent papers on the subject of "accommodative astigmatism."

In the November 1941 issue of the ARCHIVES OF OPHTHALMOLOGY, Wendell Hughes[9] presented a paper titled "Change of Axis of Astigmatism on Accommodation." The purpose of his paper was:

> " . . . to call attention to a rare condition which might easily escape detection, that is, a considerable difference in the axis of a moderate amount of astigmatism when the eyes are adjusted to the reading distance and when they are adjusted for distance fixation."

Hughes pointed out that this condition was *not* extremely rare since oculists besides himself had recognized several cases and, therefore, he cautioned that one should be alert in cases where the near vision is not as good as would be expected from the acuteness of the distance vision, and especially if the near vision is unequal. Hughes mentioned that such factors as unequal accommodation, aniseikonia and ocular diseases, such as the presence of central lenticular opacities, must of course be ruled out.

In his paper, Hughes discussed four cases of his own and also four seen by other ophthalmologists. Hughes' technique of testing for astigmatism at the near point consisted of using a ± 0.25 D. cross cylinder and having the eye being tested fixate on a near vision chart at the reading distance. The criterion of the correct axis and amount of the cylinder was the maximum visual acuity and a neutral response to the shift of the cross cylinder and the rotation of the cylinder in the trial frame an equal number of degrees to either side of the proper axis. Hughes' first case (patient age 45) resulted in the following:

Dist.: R.E. + 0.75 D.Sph. ⌒ + 1.00 D.Cyl. x 155
L.E. + 1.50 D.Sph. ⌒ + 0.75 D.Cyl. x 10

Near : R.E. + 1.75 D.Sph. ⌒ + 1.00 D.Cyl. x 120
L.E. + 2.75 D.Sph. ⌒ + 0.75 D.Cyl. x 180

A year later this correction was changed to:

Dist.: R.E. + 0.75 D.Sph. ⌒ + 1.00 D.Cyl. x 148
L.E. + 1.50 D.Sph. ⌒ + 0.25 D.Cyl. x 35
Near : R.E. + 2.00 D.Sph. ⌒ + 1.00 D.Cyl. x 130
L.E. + 2.75 D.Sph. ⌒ + 0.25 D.Cyl. x 75

In Hughes' second case (age 53) the final findings were as follows:

Dist.: R.E. + 0.87 D.Sph. ⌒ + 0.62 D.Cyl. x 15
L.E. + 0.25 D.Sph. ⌒ + 0.25 D.Cyl. x 90
Near : R.E. + 2.37 D.Sph. ⌒ + 0.62 D.Cyl. x 75
L.E. + 1.75 D.Sph. ⌒ + 0.25 D.Cyl. x 90

(Had been treated for chalazions O.U. Mittendorf dot on the posterior surface of the right lens.)

The findings in the third case (age 18) reported by Hughes were:

Dist.: R.E. + 2.50 D.Cyl. x 8
L.E. + 1.00 D.Cyl. x 180
Near : R.E. + 2.50 D.Cyl. x 18
L.E. + 1.00 D.Cyl. x 180

(50△ esotropia for distance and near with defective fusion and alternating fixation.)

In the fourth case (age 39) Hughes found:

Dist.: R.E. + 0.75 D.Cyl. x 30
L.E. + 0.75 D.Cyl. x 150
Near : R.E. + 0.75 D.Cyl. x 75
L.E. + 0.75 D.Cyl. x 150

(With cycloplegia the right cylinder was preferred at axis 45.)

The fifth case, a young man (age not given), reported by Hughes was provided by another ophthalmologist. This patient had a traumatic mydriasis right eye with rupture of some of the lower zonular fibers. The findings were:

Dist.: R.E. + 1.25 D.Cyl. x 105
L.E. + 1.25 D.Cyl. x 75
Near : R.E. + 0.50 D.Sph. ⌒ + 1.25 D.Cyl. x 135
L.E. + 1.25 D.Cyl. x 75

Another of Hughes' colleagues provided the sixth case (age 71)

which had corneal opacities, more marked in the right eye, following ulcers of both corneas. The prescriptions for which were:

Dist.: R.E. — 0.25 D.Sph. ⌒ — 2.00 D.Cyl. x 52
L.E. + 0.37 D.Sph. ⌒ + 1.50 D.Cyl. x 10
Near: R.E. + 1.50 D.Sph. ⌒ — 2.00 D.Cyl. x 150
L.E. + 2.12 D.Sph. ⌒ + 1.50 D.Cyl. x 10

The seventh case (age 50) was a patient of another ophthalmologist and had a "pseudoconical cornea with a high degree of mixed astigmatism." The prescriptions were:

Dist.: R.E. — 1.00 D.Sph. ⌒ — 9.50 D.Cyl. x 35
L.E. — 8.50 D.Cyl. x 120
Near: R.E. — 1.00 D.Sph. ⌒ — 9.50 D.Cyl. x 15
L.E. + 1.00 D.Sph. ⌒ — 8.50 D.Cyl. x 120

Hughes' eighth case furnished by another ophthalmologist simply relates that +0.75 D.Cyl. x 165 was found for distance and +0.75 D.Cyl. x 75 for near.

From his data, Hughes assumed there was a sector weakness of the suspensory fibers of the crystalline lens. He wrote: "It is my impression that this phenomenon may be due to a weakness in one portion of the suspensory fibers of the lens causing unequal effects on different meridians of the lens on accommodation, with irregular changes in the shape of the lens." This is particularly plausible in the *fifth case* in which a rupture of some of the fibers of the Zonule was seen clinically. It should be pointed out that 4 of the remaining 7 cases were presbyopic. Therefore, accommodation played very little part. Furthermore, in three cases there were corneal or lenticular anomalies.

Another recent paper on the subject of near point astigmatism appeared in the January 1944 issue of the ARCHIVES OF OPHTHALMOLOGY by Major Saul Sugar.[10] He stated that many people who wear corrective lenses, the prescription for which has been determined by accurate monocular refraction, are uncomfortable during binocular vision despite the absence of any abnormal heterophoria. He claimed that in many cases the trouble was due to changes in the axes of the astigmatism when both eyes were used together not only for distant vision but also for near vision. Sugar mentioned that no cases had been reported prior to those of Hughes[9], in 1941. He overlooked the case reported by Lancaster[6] in 1910 and referred to earlier in this paper.

A series of 70 cases were studied by Sugar; the axis of the astigmatism was determined monocularly during and after cycloplegia for

20 feet and binocularly for both 20 feet and 10 inches. Thirty-three of the 70 eyes had some changes in axis. Twenty-four varied in monocular axis during and after cycloplegia, four showed changes between the monocular and binocular axis at 20 feet, and fourteen eyes had changes (amounting at the most to 5°) between the binocular axis at 20 feet and that at 10 inches. Table No. 1 summarizes Sugar's results.

Sugar used a ±0.25 D. cross cylinder for the determination of the axis of astigmatism in binocular distant and near vision. No attempt was made to suspend the vision of the eye which was not being tested. The test objects consisted of the Snellen Chart for distance and Jaeger type for near.

TABLE NO. 1

"Binocular Refraction with Cross Cylinder Technique," by Major H. Saul Sugar (Arch. Ophthal., 31 (1), Jan., 1944)

No. of eyes studied	70
Some changes in axis	33
Variations in monocular axis before and after cycloplegia	24
Changes between monocular and binocular axis at 20 ft.	4
Changes between binocular axis at 20 feet and 10 inches	14

In the paper by Hughes and also in the one by Sugar, it is not clear that the method of determining the amount and axis of astigmatism was the same for both distance and near. It should be well known, but is apparently often overlooked, that differences in the amount and axis of astigmatism may be found even when the fixation distance, and therefore the accommodation, is held constant but the method of testing is varied. That is, one will find differences between tests made with the astigmatic chart and with the cross cylinder on letters. These differences occur without changing the fixation distance and often amount to as much as the differences found between two similar tests made when the fixation is changed from distance to near.

It is also interesting to note that neither Hughes nor Sugar found differences in the *amount* of the astigmatism as measured at distance and near. Due to the change in the effectivity of lens power when the accommodation is varied, one expects to find and, as a matter of fact, does normally find, more astigmatism at near than at distance. This factor may amount to 0.25 to 0.50 D. when the cylinder for distance is of the order of 2 to 5 D. This subject of effective power of the corrective lenses will be discussed later.

In order to point out some of the differences in astigmatic findings when various techniques are used without changing the fixation distance and also when the fixation distance is changed, I have examined several

patients using three different methods for both distance and near. The findings obtained on a representative group of cases are presented in Table No. 2. The ages of the patients are listed so that the presbyopic ones may be identified. The keratometric and retinoscopic findings are included as well as the results found by three different subjective methods.

The technique used in the three different subjective methods were described in a paper[2c] presented before the Academy last year. It was considered of utmost importance that the tests at the near point be comparable in technique with those used for distance. The cross cylinder test on letters and the stigmatoscopy test could be used for near as well as for distance, but in the case of the astigmatic chart there was none available for near point testing. Therefore, it was necessary to devise one. A photographic reduction of the Lancaster-Regan astigmatic chart and dial was made. The reduced chart (Fig. No. 1) which has spokes at 10° intervals around a full circle was pasted onto one side of a stiff piece of cardboard. On the other side of the cardboard, the dial (Fig. No. 2) was attached by means of a small cotter pin so that it could be rotated through 90° by means of a thin, stiff strip of celluloid which was attached to the back of the dial and extended beyond the entire cardboard square. This adaptation of the Lancaster-Regan astigmatic chart and dial for near point testing is the first near point astigmatic test tar-

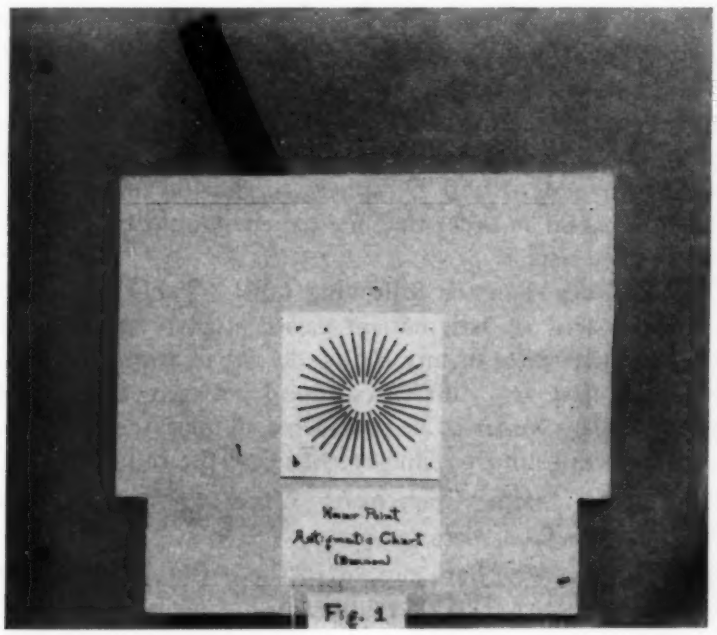
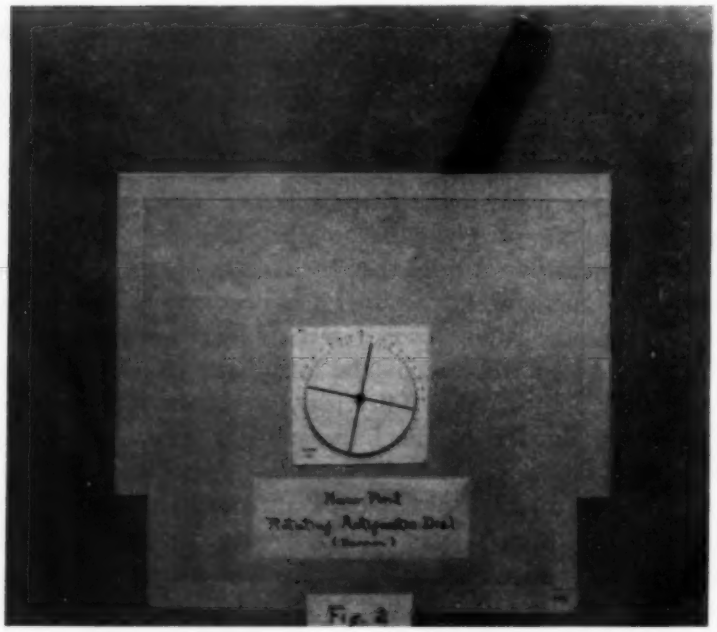


Fig. 1



get that I have seen and it has been found to be very useful and reliable.

It is important to point out that the tests for astigmatism at the near point should be made under the same conditions as the tests for distance. In the distance tests it is necessary that the patient be slightly fogged so that the astigmatic bundle lies in front of the retina. Likewise, at the near point the patient should be slightly fogged. The dynamic cross-cylinder test gives an indication of the amount of plus sphere necessary to place the conjugate foci in front of the retina. On the average, it was necessary to add +0.50 D. sphere to the distance correction (in non-presbyopic cases) in order that the patient would be slightly fogged for the near point tests.

It will be noticed in the following table (Table No. 2) that the amount and the axis of astigmatism varied slightly with the different techniques used regardless of any change in the fixation distance. It follows, therefore, that any differences found between distance and near astigmatic findings in order to be considered significant should be greater than the differences found by simply changing the techniques.

Effectivity of Astigmatic Corrections When Fixation Distance (or Accommodation) is Changed:

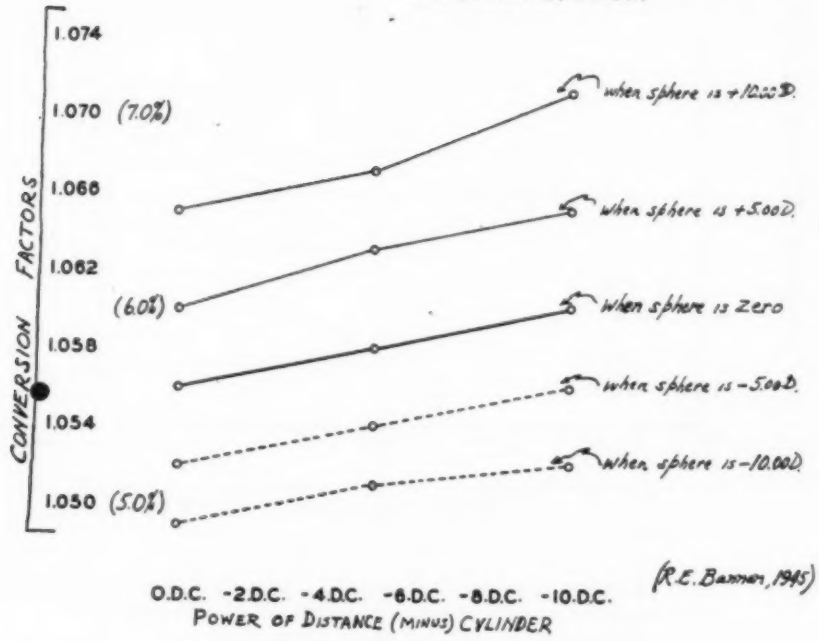
Many of those who have supported the hypothesis of accommodative astigmatism neglected to take into consideration the optical change

in the effectivity of the correcting lenses when the fixation is changed from distant to near. Emsley[11], Neumueller[12], Pascal[13], and Hofstetter[14] in recent years have pointed out this important factor, the neglect of which results in making what is a full astigmatic correction for distant vision, an under-correction for near. This is because the change in the power of the crystalline lens in the act of accommodation does not take place at the position of the spectacle lens placed 10 to 15 mm. from the eye.

(FIG. No. 3)

GRAPH OF CONVERSION FACTORS FOR AMOUNT OF NEAR POINT ASTIGMATISM BASED ON DISTANCE SPHERE AND CYLINDER FINDINGS, WHEN EYEWIRE DISTANCE OF TEST LENSES IS 13.75 m.m. AND WHEN STIMULATION TO ACCOMMODATION IS 2.00 DIOPTERS.

(The data for this graph were obtained by interpolations from TABLE NO. 1 - THE CORRECTION OF ASTIGMATISM FOR NEAR WORK - by H. T. Hofstetter, Am. J. Optom., and Arch. Am. Acad. Optom., 22 (3), March 1945, 121-134.)



The accompanying graph (Fig. No. 3) will show that for a given amount of accommodation, for a specified distance of the lenses from the cornea, and for a few other minor factors which will be mentioned later, the near astigmatic correction should be increased by multiplying the amount of the cylinder found for distance by the "conversion factor." This graph has been prepared by interpolating the calculations made by H. W. Hofstetter[14] and is the basis for the figures entered in column VIII of my data (Table No. 2). In preparing this graph I have simplified matters by using one eyewire distance (13.75 mm.) since all my findings were made when the trial case lenses were 13.75 mm. from the cornea. Furthermore, the graph I have constructed is based upon an

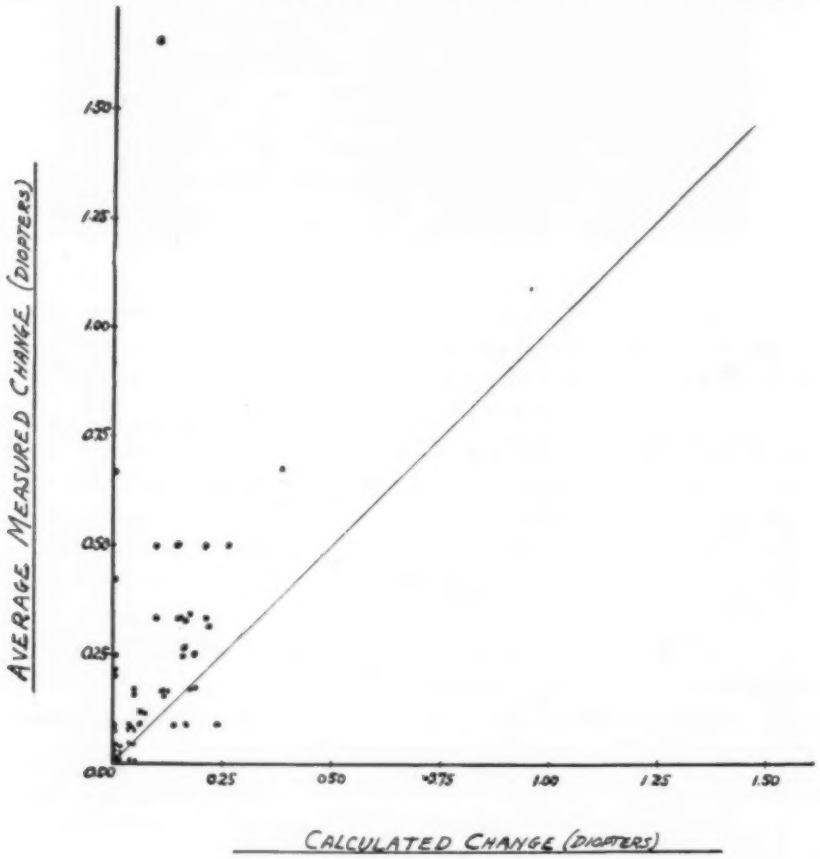


FIG. NO. 4 (Bannon). SCATTER-DOT GRAPH OF THE MEASURED AND CALCULATED DATA FOR DIFFERENCES BETWEEN DISTANCE AND NEAR ASTIGMATISM

accommodation of the order of 2 diopters, because my data were obtained for the near point of 16" (2.50 D.) and since the technique at the near point consisted of using a slight fog of +0.50 D., the actual accommodation was only 2.00 diopters except, of course, in the cases of

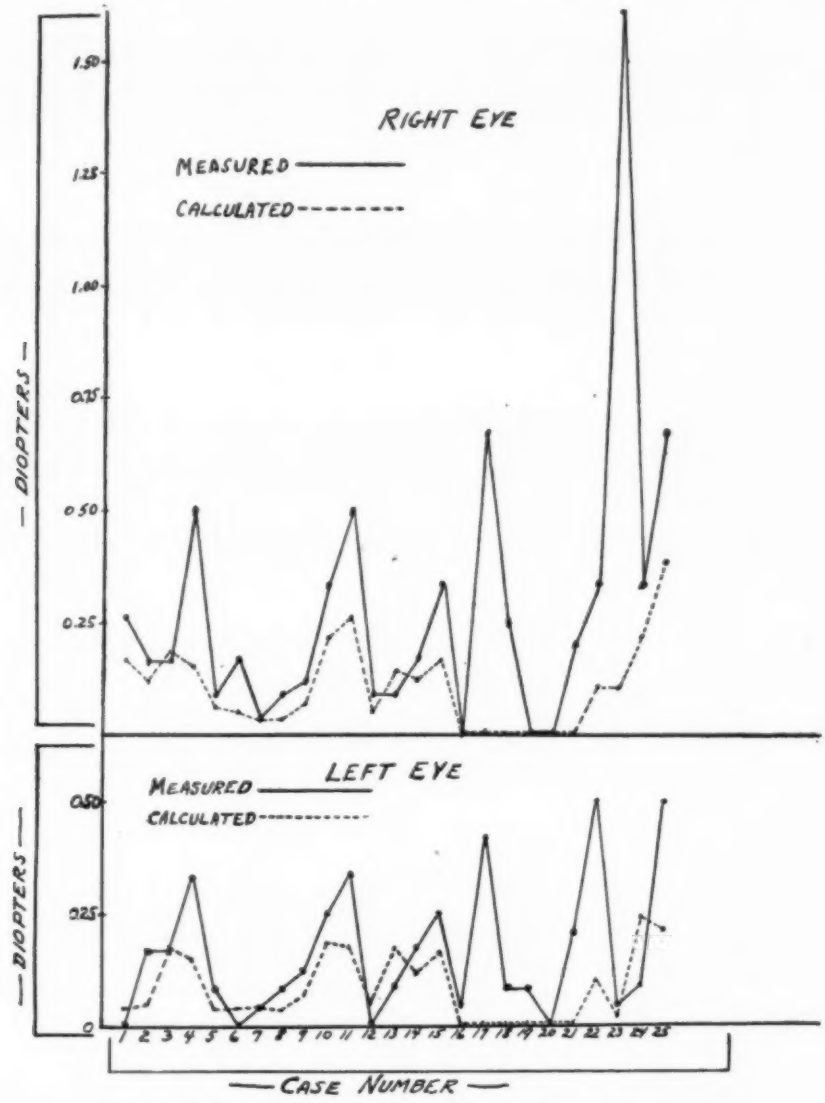


FIG. NO. 5 (Bannon). GRAPHS SHOWING MEASURED AND CALCULATED CHANGES BETWEEN DISTANCE AND NEAR ASTIGMATISM

TABLE NO. 2

ASTIGMATIC FINDINGS FOR DISTANCE AND NEAR

I	II	III	IV	V	VI	VII	VIII
Case	Age	Keratometer	Retinoscopy	Astig. Chart	Cross Cyl.	Stigmatoscopy	Approx. Calculated Near Astig.*
1	34	R−3.00×2	0.00−2.75×180	(D)−2.75×2	−2.50×5	−2.75×180	....
		L−1.25×15	−1.00−0.75×15	−0.75×15	−0.75×20	−0.75×15	....
				(N)−3.00×5	−2.75×180	−3.00×2	2.83
				−0.75×15	−0.75×15	−0.75×15	0.79
2	41	R−2.25×7	+1.75−2.00×10	(D)−2.00×10	−2.00×10	−2.00×8	....
		L−1.25×174	+1.75−1.00×170	−0.75×160	−1.00×170	−0.75×170	....
				(N)−2.25×5	−2.00×10	−2.25×10	2.12
				−1.00×170	−0.75×170	−1.25×170	0.88
3	27	R−2.75×177	−1.25−3.00×180	(D)−3.25×172	−3.00×180	−3.25×175	....
		L−2.75×178	−1.25−3.00×180	−3.25×180	−3.00×180	−3.25×178	....
				(N)−3.50×170	−3.00×170	−3.50×172	3.35
				−3.50×180	−3.00×175	−3.50×178	3.35
4	43	R−3.25×10	+5.00−2.75×10	(D)−2.50×3	−2.50×5	−2.50×5	....
		L−3.00×170	+4.50−2.50×170	−2.50×162	−2.50×160	−2.50×165	....
				(N)−3.00×10	−3.00×10	−3.00×5	2.65
				−2.75×165	−3.00×160	−2.75×163	2.65
5	25	R−1.50×25	+0.50−1.00×10	(D)−1.00×20	−1.00×25	−1.00×10	....
		L−0.50×180	−0.50−0.75×80	−0.50×80	−0.50×90	−0.50×80	....
				(N)−1.00×10	−1.00×15	−1.25×15	1.06
				−0.50×80	−0.75×90	−0.50×90	0.53
6	46	R−0.50×125	+0.50−0.75×120	(D)−0.75×120	−1.00×115	−0.75×125	....
		L−1.00×23	+0.50−0.75×20	−0.50×25	−0.75×30	−0.50×20	....
				(N)−1.00×120	−1.00×110	−1.00×110	0.88
				−0.50×30	−0.50×40	−0.75×20	0.61
7	43	R−1.25×17	+1.25−0.50×20	(D)−0.50×20	−0.75×30	−0.62×15	....
		L−1.25×5	+1.25−0.50×170	−0.50×160	−0.75×145	−0.62×165	....
				(N)−0.50×15	−0.50×10	−0.75×10	0.66
				−0.50×160	−0.50×165	−0.75×170	0.66
8	33	R−1.00×180	+1.25−0.50×180	(D)−0.50×10	−0.50×20	−0.50×180	....
		L−1.00×5	+1.25−0.50×180	−0.50×170	−0.50×160	−0.50×180	....
				(N)−0.50×5	−0.25×10	−0.50×180	0.53
				−0.50×175	−0.25×170	−0.50×180	0.53
9	35	R−2.00×32	+2.50−1.50×30	(D)−1.37×40	−1.00×35	−1.25×30	....
		L−2.12×152	+2.50−1.50×150	−1.37×150	−1.00×150	−1.25×150	....
				(N)−1.50×25	−1.25×35	−1.25×30	1.28
				−1.50×155	−1.25×140	−1.25×150	1.28

10	31	R−4.25×3 L−4.50×2	+3.00−3.50×180 +2.75−3.00×180	(D)−3.50×3 −3.25×2	−3.50×180 −3.00×180	−3.50×2 −3.00×2	....
				(N)−3.75×2 −3.25×2	−4.00×5 −3.50×180	−3.75×5 −3.25×3	3.71 3.26
11	37	R−5.00×73 L−2.50×127	−1.50−6.00×70 −1.00−3.50×140	(D)−4.50×70 −3.00×140	−5.00×75 −3.00×145	−4.00×65 −2.50×140	....
				(N)−5.00×65 −3.00×145	−5.00×70 −3.50×140	−5.00×75 −3.00×145	4.76 3.00
12	38	R−0.75×50 L−1.12×145	−4.00−1.00×60 −4.00−1.00×120	(D)−1.00×65 −1.00×122	−1.00×75 −1.00×110	−0.75×35 −1.00×115	....
				(N)−1.00×55 −1.00×120	−1.00×75 −1.00×135	−1.00×65 −1.00×130	0.97 1.05
13	24	R−3.00×15 L−3.50×160	−0.25−2.50×20 +1.00−3.00×160	(D)−2.50×17 −3.00×152	−2.25×20 −2.75×150	−2.50×17 −3.00×155	....
				(N)−2.25×20 −2.75×150	−2.75×20 −3.25×155	−2.50×18 −3.00×153	2.56 3.09
14	33	R−2.50×3 L−2.50×2	+2.00−2.00×180 +2.25−1.75×175	(D)−2.25×3 −2.00×178	−2.25×4 −2.00×176	−2.00×5 −2.00×175	....
				(N)−2.50×6 −2.25×178	−2.50×10 −2.25×180	−2.25×4 −2.00×176	2.29 2.12
15	34	R−3.00×3 L−3.00×178	+2.00−2.75×10 +2.00−2.25×170	(D)−2.50×7 −2.50×178	−3.00×10 −3.00×170	−2.50×5 −2.50×177	....
				(N)−3.00×10 −2.75×175	−3.25×10 −3.25×175	−2.75×7 −2.75×177	2.83 2.83
16	64	R−1.50×175 L−0.25×50	−0.75−1.00×150 −0.50−1.50×70 add +2.50 o.u.	(D)−1.00×155 −1.75×70	−1.00×150 −1.87×75	−1.00×150 −1.75×72	....
				(N)−1.00×168 −1.75×77	−1.00×170 −2.00×70	−1.00×165 −1.75×80	1.00 1.79
17	68	R−4.00×103 L−3.50×65	+2.00−5.50×105 +2.00−5.00×70 add +2.50 o.u.	(D)−5.50×103 −5.25×73	−5.50×105 −5.50×75	−5.50×105 −5.00×75	....
				(N)−6.00×105 −5.50×70	−6.50×105 −6.00×80	−6.00×105 −5.50×72	5.50 5.25
18	54	R−2.00×175 L−1.25×3	+1.00−2.00×175 +2.00−1.00×5 add +2.50 o.u.	(D)−2.25×170 −1.25×10	−2.00×175 −1.00×10	−2.25×170 −1.25×10	....
				(N)−2.50×170 −1.50×10	−2.25×170 −1.00×10	−2.50×175 −1.25×5	2.17 1.17
19	50	R−0.25×180 L−2.00×10	+0.75−0.75×90 +4.00−2.50×180 add +2.00 o.u.	(D)−0.75×85 −2.25×170	−0.75×90 −2.00×160	−0.50×90 −2.25×175	....
				(N)−0.75×90 −2.25×175	−0.75×90 −2.00×170	−0.50×90 −2.50×165	0.67 2.17

I	II	III	IV	V	VI	VII	VIII
Case	Age	Keratometer	Retinoscopy	Astig. Chart	Cross Cyl.	Stigmatoscopy	Approx. Calculated Near Astig.*
20	53	R−1.75×108	+1.00−3.00×110	(D)−3.00×110	−3.25×102	−3.25×108	....
		L−2.37×79	+1.00−3.50×80	−3.50×80	−3.50×80	−3.50×80	....
			add +2.00 o.u.				
				(N)−3.00×105	−3.25×108	−3.25×108	3.17
				−3.50×80	−3.50×80	−3.50×80	3.50
21	67	R−0.50×18	+2.50−1.00×15	(D)−1.00×20	−0.75×25	−1.00×20	....
		L−0.25×5	+2.00	neg.	neg.	neg.	....
			add +2.25 o.u.				
				(N)−1.12+20	−1.00×25	−1.25×20	0.92
				−0.12×180	−0.25×90	−0.25×180	neg.
22	46	R−6.25×7	+2.50−6.50×5	(D)−6.50×9	−6.50×10	−6.25×8	....
		L−6.25×3	0.00−6.50×175	−6.25×175	−6.25×175	−6.25×175	....
			add +1.50 o.u.				
				(N)−6.50×6	−7.00×10	−6.75×7	6.52
				−6.50×177	−7.00×175	−6.75×175	6.35
23	45	R−3.00×142	+4.50−3.50×140	(D)−3.50×140	−4.00×140	−3.50×135	....
		L−1.50×173	+2.00−1.00×160	−1.00×155	−1.25×160	−1.00×155	....
			add +1.75 o.u.				
				(N)−5.25×140	−5.50×145	−5.25×135	3.77
				−1.00×160	−1.25×170	−1.12×160	1.10
24	32	R−3.62×22	+3.50−3.50×20	(D)−3.75×17	−3.75×18	−3.50×20	....
		L−3.50×155	+3.50−3.50×160	−4.00×140	−4.00×145	−4.00×142	....
				(N)−4.00×17	−4.00×15	−4.00×20	3.89
				−4.00×143	−4.00×140	−4.25×145	4.24
25	18	R−6.25×17	+4.00−5.00×20	(D)−6.00×20	−6.00×17	−6.00×18	....
		L−4.00×170	+3.00−3.00×160	−3.50×162	−3.50×165	−3.50×162	....
				(N)−6.50×15	−6.50×17	−7.00×20	6.38
				−4.00×165	−4.00×163	−4.00×160	3.71

(D) Distance (N) Near

*Based on the average amount of astigmatism found for distance; the change in effective power of the correcting lenses due to accommodation, distance of lenses from the eyes, and the accompanying graph of conversion factors. See text of paper for further explanation.

the presbyopes. In these instances, the data in column VIII were not obtained from my graph but by interpolations from Hofstetter's tables[14]. One more point about the graph I have made, is that I assumed the meridian for which the eyes accommodate would always be the axis of the minus cylinders. As Pascal[13] and Hofstetter[14] pointed out it does make a difference whether the less hyperopic or the more hyperopic meridian is taken as the meridian for which the eyes accommodate. However, for my data this difference is of little importance and since it cannot be determined unequivocally for which meridian the eyes accommodate, one assumption is as good as another. For the purpose here is merely to show the order of the expected difference in the amount of the near cylinder as compared to the one found for distant fixation. As Emsley[11] points out, the astigmatic correction at near, in non-presbyopic cases, is roughly 5 to 10% greater than that required for distance.

It will be noticed from a cursory inspection of the data in Table No. 2 that in each case the cylinder, both *measured* and *calculated for* at the near point, is usually slightly greater than that found for distance. This is more marked when the astigmatism found for distance is of the order of 4 or 5 diopters. This indicates that at least part of the differences found between distance and near astigmatic measurements are due to the change in effective power of the correcting lenses.

A scatter-dot graph (Fig. No. 4) shows that at least half of the measured differences between the amount of astigmatism for distance and near can be accounted for by calculating the change in effectivity of the correcting lenses. Fig. No. 5 presents the same data in a different manner and enables one to identify individual cases and the differences found in each of them.

With respect to changes in the axis of the astigmatism as the fixation is changed from distance to near, it appeared by a rough inspection of the data that no consistant change of axis in one direction or the other was apparent. However, by comparing the changes in axis found by the various techniques (See Table No. 3), an important point is clear, namely, in the case of the stigmatoscopy technique, a binocular method, nearly twice as many patients had a shift at the near point toward a more oblique axis. This may indicate that in binocular vision at the near point there is a torsion of the eyeball or a tilt of the crystalline lens such that the horizontal meridian for distance becomes slightly oblique for near.

In a greater number of cases, when the tests were monocular (astigmatic chart and the cross cylinder), the changes in axes at the

near point were toward "converging down," i.e., R.E. minus cylinder axis 135 and/or L.E. minus cylinder axis 45. This suggests that in monocular vision the eye rotates in at the top during near vision. However, the results from the binocular test (stigmatoscopy) in a greater number of cases indicates that the axes at near became more "converging up" which suggests that in binocular vision, the eyes rotate outward at the top during near point fixation. See Table No. 4.

TABLE NO. 3

Axis Changes Between Distance and Near Astigmatic Findings

	Astig. Chart (No. of Cases)	Cross Cyl. (No. of Cases)	Stigmatoscopy (No. of Cases)
Axis more oblique at near	11	11	13
Axis less oblique at near	12	11	8
No change in axis	2	3	4

TABLE NO. 4

Nature of Axis Changes Between Distance and Near Astigmatic Findings

	Astig. Chart (No. of Cases)	Cross Cyl. (No. of Cases)	Stigmatoscopy (No. of Cases)
Axis at near changed toward converging up	9	9	14
Axis at near changed toward converging down	14	13	7
No change in axis	2	3	4

SUMMARY AND CONCLUSIONS:

The astigmatic correction for near point use has usually been assumed by the majority of practitioners to be the same as that found for distance. This assumption does not coincide with the philosophy of those who insist that tests should be made at the near point, rather than rely on the belief that distance tests provide sufficient data for near point corrections. Furthermore, the assumption that near and distance astigmatic corrections should be the same is not supported by scientific nor clinical evidence.

Despite the possibility of astigmatic accommodation or of some phenomena which suggests sectional changes in the crystalline lens, one must take into consideration the factor of a difference in the effective power of sphero-cylindrical corrections that occurs as the fixation distance and the accommodation are changed. Also, the clinical data presented in this paper show that differences in the amount and axis of astigmatism are found—if looked for—when the fixation is changed from distance to near.

The practical importance of measuring the astigmatism at the near point may be judged by noting in Table No. 2, or in the accompanying graphs (Figs. 4 and 5), that in 18 of the 50 eyes (36%) a difference of 0.25 D. or more was found between the average amount of astigmatism for distance and near. In 7 of the 50 eyes (14%), a difference of 0.50 D. or more was found between distance and near astigmatism. Since an astigmatism of 0.25 D., and especially 0.50 D., is usually considered clinically significant, it would seem that a test which discloses such an astigmatism, in addition to that usually measured, should be valuable in routine practice. Furthermore, with respect to axis it will be noticed, when one considers only the eyes with one diopter or more astigmatism in which the average axis at near differed from the average axis found for distance by 5° or more, that 17 of the 50 eyes (34%) fall into this category of a clinically significant change in axis at the near point.

The differences in amount between distance and near astigmatic findings may be explained, for the most part, on the basis of the change in the effectivity of the sphero-cylindrical correction placed a finite distance from the eyes and the accommodation occurring within the eye for near point vision. The changes in axes found between distance and near astigmatic tests—especially during binocular fixation—may be explained by a rotation of the eyes as they converge and look downward in near vision or by a tilting of the crystalline lens or by a combination of both factors.

In so far as this study is concerned, there is no evidence which necessitates the hypothesis of astigmatic accommodation. In the writer's opinion, there is no need for such a complicated theory which implies a purposeful sectional change in the crystalline lens. In the past, the investigators who proposed and supported this theory were influenced by the data they obtained but they neglected to take into consideration such factors as have been mentioned in this paper; that is, that changes in the amount and axis of astigmatism may be found by various techniques without a change in the fixation distance; that a spherical change will result in a different astigmatic condition; and that there is a change in the effective lens power as the accommodation is varied.

Aside from trying to settle the controversy of whether or not astigmatic accommodation exists in human beings, this paper will serve its purpose best if it encourages practitioners to *measure* the astigmatic condition at the near point as well as for distance. Although the method of stigmatoscopy is perhaps the best for determining the astigmatism for

both distance and near, it is realized that this technique is not available generally. Besides the use of the cross cylinder test on letters at both distance and near, an original method of using the astigmatic chart and dial at the near point is presented in this paper and it is hoped that this simple technique will be adopted by practitioners who will add to the data presented in this paper, as well as determine for themselves and their patients the value of measuring astigmatism at the near point.

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DISCUSSION

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First of all I should like to take this opportunity to congratulate Doctor Bannon on this fine presentation—and I believe I will not be out of order at this time to extend to him an expression of appreciation from the American Academy of Optometry for a paper well conceived, thoroughly prepared and so handsomely presented.

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I have read and re-read this paper with a very critical eye for the purpose of preparing this discussion, and now, even after having heard it presented, I still have no real criticism to make. I have, however, found this paper very thought provoking. It has led me to ask several questions, some of which I have been able to answer for myself and will now present to you for your consideration.

Doctor Bannon makes the statement and demonstrates very convincingly that a spherical change of focus will effectively eliminate an astigmatic error in focus. I am led to ask this question: "But do we humans in fact, do this act of spherical accommodation to compensate for our own astigmatic errors?" The question is just about as difficult to answer as it is to find out if the light really goes out when the ice-box door is closed. But I believe that each of us in using a retinoscope has, from time to time, observed a phenomenon which has a direct bearing on this problem. In my routine technique for static retinoscopy I use plus spheres to neutralize the strongest plus or weakest minus meridian, and then use minus cylinders to neutralize the other principal meridian. In my experience, in refracting hyperopes especially, it frequently happens that after I have approximately neutralized the astigmatism, I find that the neutral reflex in my first meridian has changed to a with motion and that it now becomes necessary for me to add another +0.25 or +0.50 sphere to bring about neutralization. Is this not a pretty good indication that the hyperopic patient whose astigmatism was uncorrected was exerting positive accommodation to effect a lessening of the blur? How else can we explain the action of *minus* cylinders to *relax* accommodation?

A second question which has occurred to me in reading this paper has to do with evaluating changes in axis of astigmatism in terms of its effect on the patient. Differences in power between distant and near findings are easily interpreted. If a patient is found to require —3.00 D. Cyl. ax 180 at twenty feet, and —3.50 D. Cyl. ax 180 at sixteen inches, it is immediately apparent that when we prescribe the distant finding for constant wear, we leave the patient undercorrected by 0.50 D. for near vision, and we will expect the patient to suffer blur and asthenopia accordingly. But suppose there is found to be no difference in power, but only a difference in axis between the distant and near findings. If we find a —3.00 D. Cyl. ax 180 at twenty feet and a —3.00 D. Cyl. ax 5 at sixteen inches, and prescribe the distant finding for constant wear, what are the effects on the patient's vision when the correction is worn at near? The degree of distortion and blur of the retinal image depends

not alone on the error in axis of the cylinder but also, and to a major degree, upon the power of the cylinder which is incorrectly worn. Thus it is impossible to interpret a given error in axis, per se, in terms of its effect upon the patient's vision. It is, however, possible to reduce errors in axis for various cylinder powers to equivalent dioptric values which can be directly interpreted.

TABLE 1

Sphero-Cylindrical Error Introduced by Small Errors of Axis for Astigmatism Correctable by —1.00 D. Cyl. ax 180

Error of Axis	Erroneous Axis	Sphero-Cylinder Required to Correct Refractive Error Introduced
+30	30	+0.50 D. Sph.⌒—1.00 D. Cyl. ax 150
+25	25	+0.43 D. Sph.⌒—0.85 D. Cyl. ax 147½
+20	20	+0.35 D. Sph.⌒—0.69 D. Cyl. ax 145
+15	15	+0.27 D. Sph.⌒—0.53 D. Cyl. ax 142½
+10	10	+0.18 D. Sph.⌒—0.37 D. Cyl. ax 140
+ 5	5	+0.09 D. Sph.⌒—0.18 D. Cyl. ax 137½
— 5	175	+0.09 D. Sph.⌒—0.18 D. Cyl. ax 42½
—10	170	+0.18 D. Sph.⌒—0.37 D. Cyl. ax 40
—15	165	+0.27 D. Sph.⌒—0.53 D. Cyl. ax 37½
—20	160	+0.35 D. Sph.⌒—0.69 D. Cyl. ax 35
—25	155	+0.43 D. Sph.⌒—0.85 D. Cyl. ax 32½
—30	150	+0.50 D. Sph.⌒—1.00 D. Cyl. ax 30

Table 1 shows the Sphero-Cylindrical lens which will correct the refractive error introduced by various small errors of axis for an astigmatism which would be fully corrected by a —1.00 D. Cyl. ax 180. This table is subject to a certain degree of inaccuracy because the influence of such factors as vertex distance, lens thickness, and total spherical refractive error, etc., were not taken into consideration. It is presented as a first approximation rather than an accurate solution of our problem, and for this purpose it is adequate.

Demonstration: Let a +1.00 D. Cyl. ax 180 represent a patient's refractive error. Then a —1.00 D. Cyl. ax 180 will be the refractive correction.

+1.00 D. Cyl. ax 180⌒—1.00 D. Cyl. ax 180=0.00

Now rotate the correction cylinder to axis 30°. From the table we find that a sphero-cylindrical error has been introduced which will be corrected by +0.50 D. Sph.⌒—1.00 D. Cyl. ax 150.

+1.00 D. Cyl. ax 180⌒—1.00 D. Cyl. ax 30⌒+0.50 D. Sph. ⌒—1.00 D. Cyl. ax 150=0

Q. E. D.

From the table it will be seen that a —1.00 D. Cyl. erroneously worn at axis 5° (when it should be worn at axis 180°) will cause a sphero-cylindrical refractive error to be introduced which could be cor-

rected by +0.09 D. Sph.⌒—0.18 D. Cyl. ax 137½. For a —3.00 D. Cyl. worn incorrectly at the same axis the sphero-cylinder would be three times as great or, +0.27 D. Sph.⌒—0.54 D. Cyl. ax 137½. These are values that have clinical significance. We will doubtless agree that a five-degree error in axis for a one diopter cylinder would, in all probability, cause very little difficulty for the patient. However, this same axis error of five degrees on a three diopter cylinder would introduce a refractive error which might well be beyond the patient's limit of tolerance, and we would be justified in modifying our prescription to take this into account.

Table 1 can be extended for various cylinder powers by multiplying the resultant sphere and cylinder by the appropriate factor, as was done in the above example. The table can also be extended for various original cylinder axes by adding or subtracting the appropriate correction to the axis of the resultant cylinder.

Other questions which have come to mind in connection with the subject of this paper are as follows:

1. What is the standard error of measurement of astigmatism for the various methods mentioned in this paper, and are the differences found between astigmatism at distance and at near, greater than this value?

2. Will objective measures of astigmatism at the near point, such as dynamic skiametry, confirm the results obtained with subjective methods?

3. Can the effect of convergence on the corneal curvatures be demonstrated by means of the keratometer using a suitable fixation device to establish and maintain a high degree of convergence?

4. What do these differences in amount and axis of astigmatism at distance and at near mean to the patient in terms of vision and comfort, and what is the best method of correcting it? Two different refractive corrections, or a compromise correction?

I raise these questions, not as criticisms of the paper, but in the hope that some member or members of the Academy will take it upon themselves to discover the answers to these and doubtless other questions which may be raised in connection with this interesting subject. I am certain that we have all enjoyed this paper and will take home with us to our practices, information which will be of immense practical value to ourselves and to our patients in the service of the eyesight of humanity.

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NOTES ON THE HYGIENE OF THE REFRACTING ROOM*

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Occasionally a situation develops which, though it should not be, is tolerated simply because no immediate remedy suggests itself. Thence it is but a step to a state of well-rooted complacency.

Such a bad situation exists in relation to those parts of the instruments used in eye examinations which come in contact with the chin, nose, forehead, ears and scalp of the patient. That the situation demands attention becomes obvious the moment a few pertinent questions are asked.

What are the chances of infection, if any? What precautions have been taken to prevent possible infection? What precautions should be taken? Even granting that the factor of infection may be dismissed, who dare assume that the patient can dismiss the distaste or disgust that any thought of such promiscuous contacts is sure to arouse? If not a question of hygiene, is it not one of good taste and, as such, still serious enough to warrant consideration?

Meeting the issue fairly, the following questions call for unreserved answers:

Should the parts mentioned above be treated in any way? Should they be treated after every case? After certain cases? What constitutes adequate treatment? Should they be merely cleansed, thoroughly disinfected, or actually sterilized? And, if so, how?

These issues are so interrelated they may be considered jointly. All that is required to bring about a full realization of the true significance of the issue is to bring the facts relating to it into the open.

One of the most important, and least appreciated, facts pertaining to the practice of optometry is that the element of danger therein from infection is essentially nil. The authors never experienced its occurence in their own practice nor heard of it occurring in another's. This is readily understandable. No one acutely ill visits the optometrist. Even a slight indisposition affords almost everyone a welcome excuse for postponing such a visit. Therefore essentially all optometric patients are well persons except for the "common cold," but this has no specific bearing

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on optometry because almost everyone is exposed to "colds" everywhere, every minute.

Not only are the optometrist's patients in almost all instances well persons but also they are well-groomed, neat, clean and cultured—cultured because culture requires much reading, much reading requires eye care and eye care requires the optometrist.

But this is not the whole picture. For each practitioner to see the real picture in relation to his own practice, let him come from behind generalities and look at his own specific situation, put himself in his patient's place, and ask himself some pertinent questions.

Let attention be confined to the temples of the trial frame and to the chin rests and head rests of whatever instruments are used, and let it be assumed that nothing is done to these parts between examinations.

As a fair example, let the morning's first patient be the young matron—neat from top to toe. Immediately after her chin and forehead have rested in the ophthalmometer, and the trial frame has rested on her face, would you mind submitting your head to these instruments, untreated?

The next patient is the artist with bushy beard who hurried to keep his appointment; again, after their application to him, would you mind submitting to these instruments, untreated?

The third patient is the adolescent, whose few pimples may or may not represent acne; would you like to follow him?

Now, reverse the order, and ask the artist if he would like these instruments used on him after they were used on the boy, and ask the young matron, if she wants them used on her, without their being cleansed, disinfected or sterilized, directly after they were used on the boy with his pimples and the artist with his beard and perspiring brow?

Not too pretty a picture no matter what examples may be used. And the picture takes on still more sombre hues in the ophthalmologist's office where pathology, local and general, intensifies the issue.

The third group among the ophthalmic professions, the dispensing optician, functioning purely as such, is relatively only slightly involved, although some very questionable matter oozes on to his pliers from some of the mountings he adjusts.

True, some attempts have been made to meet this issue but complete protection has never been attempted, let alone accomplished. The same manufacturer who supplies protective means at one point, will leave another point on the same instrument exposed. Nearly everyone uses a trial frame, some use nothing else, yet no serious attempt has been

made to shield the temples which go into all kinds of hair and against all kinds of scalps.

Viewing the whole subject broadly and granting there is no evidence indicative of danger from infection, the authors ask, and intend to keep on asking: Why should not this obviously distasteful, if not disgraceful, situation be remedied? And, in fairness: How may it be remedied?

The authors will relate what they have tried to do, what they have done and what they suggest doing further about it.

For some time—but that was many years ago—they, with everyone else, gave no thought to this matter at all.

Soon, however, they became aware of the real situation somewhat as outlined above. Then they secured a sterilizer, made primarily for dentists, in which a gas was generated which, allegedly, killed germs. In this were placed the trial frame and the detachable chin-rest of the ophthalmometer after each application. This sterilizer was a small cabinet.

On this principle they had made a larger cabinet in which were kept all hand instruments, all detachable parts of instruments too large to go in it, as well as the tray of trial lenses and the trial frame. The disinfecting agent used therein was formic aldehyde (CH_2O). This left only the head rest of the ophthalmometer to be cleansed by wiping with formalin, a solution of formic aldehyde.

But the situation rapidly increased in complexity. Perimeter, refractor, campimeter, kratometer, phoroptor, stereorthoptor, binocular ophthalmoscope, slit-lamp, metronoscope, ophthalmograph, arm and head rests of the ophthalmic chair, and many other instruments which came and went, became a part of the equipment used routinely and presented a disinfecting problem defying a practical solution.

Many of the parts which touched the patient were not detachable hence not subject to gas-chamber treatment and one could not reconcile disinfecting some and neglecting other equally exposed parts.

Various manufacturers were urged to make all the parts which touched the patient in duplicate and of such material and in such form as would permit one set being sterilized while the other was in use, alternately.

This none saw fit to do.

The best the authors could do was to use the pressed paper covers wherever available, continue to disinfect detachable parts in a gas-chamber, and cleanse the other parts with a lysol solution or formalin.

The effect is reasonably satisfactory, the means unreasonably diverse and troublesome.

Considering how few take even this much trouble to cleanse instruments between examinations, in fact how many take no action whatever toward this end, it may be concluded safely that as not one case of infection has been reported from literally hundreds of thousands of exposures, there exists no serious menace.

But while this analysis eliminates the need for thorough sterilization, e.g., by boiling, it establishes imperatively from the viewpoint of good taste alone, the need for some practical method of disinfecting or otherwise cleansing the parts under consideration.

These parts may be cleansed sufficiently with soap and water or with lysol or other disinfecting solutions but there is no likelihood of so messy a method being widely adopted—the difficulties inhibiting action.

One practical solution of this issue seems to lie in the adaptation to it of one of the ultra violet lamps, whose rays are known to destroy all air-borne and surface bacteria by a few seconds exposure. Once a portable hand lamp with ultra violet bulb is available*, good taste and good ethics will—and should—demand its use toward remedying a situation for which there will then be no excuse for tolerating.

The optometrist must realize that a patient sitting in the reception room frequently sees patients whom he would rather precede than follow when it comes to putting his face in the various instruments used presumably on all patients. Few speak about this but many must do an awful lot of thinking.

Is there much room for doubt that essentially every patient would be greatly relieved and be favorably and gratefully impressed upon seeing (and he should be permitted to see) the disinfecting operation carried out?

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* Editor's Note—We are informed that the Premier Optical Products Company, 119 West 57th St., New York 19, New York, has plans for supplying such equipment for optometric offices.

A SUGGESTED "DYNAMIC" SUBJECTIVE TEST*

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The dynamic subjective test describes a technique that was originated, but not published by Dr. J. O. Baxter, Sr., of New Bern; N. C., over a period of years beginning at the time of publication of Tait's Dynamic Retinoscopy. The publication of which gave him his original ideas on a dynamic subjective test.

The system has been gradually evolved and put into practice by Dr. J. O. Baxter, Sr., and the writer. At present the writer has access to thousands of case records in which this technique, with a few variations has been used exclusively with marked and lasting results, with a large percentage of patients accepting an addition of from an eighth of a diopter to as high as one and a half diopters. This addition being over and above the correction found with the standard routine.

The dynamic subjective technique is as follows: The patient is seated behind the refractor. The left eye is occluded. The patient is directed to look at the smallest line of letters that can be read at sixteen inches. With the original subjective correction from the standard routine before the patient's eyes, plus is added to the right eye until no letters can be distinguished. After this point has been reached, this addition of plus is added to the still occluded left eye. Then the right eye is occluded and the left eye is directed to the lines of smallest print. As this addition is the blur out point on the right eye the print may not be read by the left eye until a slight reduction of plus is made. However, and this occurs in a number of cases, more plus can be added over and above the blur out point of the right eye. It is noted at the beginning that as the amount of plus is slowly increased before the right eye, and the ciliary spasm relaxed, a corresponding relaxation occurs on the still occluded left eye.

When the blur out point on the left eye is reached the left eye is again occluded and the right eye directed to the lines of small print. If the letters can still be read more plus is added until the blur out point is again reached. This is repeated monocularly until the absolute or true blur out point is reached on each eye. This data is recorded.

With the lines of small letters in place at sixteen inches, and the

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absolute monocular blur out point findings in place, binocular vision is given the patient. The absolute binocular blur out point is now determined. This binocular blur out point has been found in many cases to be different from the monocular blur out point. This data is recorded.

The near point card is now removed and the patient's attention is directed to the smallest letters that could be read at a distance, or clinical infinity, after the standard routine. The plus is rapidly reduced from the binocular blur out point taken at sixteen inches until the small letters at twenty feet can be read. The duochrome test is used to check the final dynamic subjective finding. This is recorded. This finding has been found in many cases to be higher in plus or lower in minus than the original standard subjective, and has been so successful that this technique has become standard routine on all non-presbyopic patients by the writer and his father.

The next procedure is to complete the phoria tests for distance and at sixteen inches with the dynamic subjective finding in place. The positive and negative fusional reserves are taken and recorded. These findings are compared with the differences between the monocular and binocular blur out points.

Attention may be called to the fact that the anisometropia is usually accurately determined with this technique at sixteen inches. Frequently anisometropia is ironed out with the technique which may indicate the presence of unilateral ciliary cramp.

It is essential that plenty of time be taken with the technique. After blurring the patient out at sixteen inches, five additional minutes of looking at the letters will frequently relax the ciliary muscles so that more plus can be added again. It should be noted that cycloplegics, which in one sense do the same thing, take a good deal longer and are more inconvenient to the patient. It is our opinion that there is no excuse for using cycloplegics as this technique gives the amount of latent error and the subjective that can be comfortably and efficiently worn at one time. The writer and his father are convinced that the patient can wear his dynamic subjective refraction longer and more comfortably than with the ordinary subjective technique.

Two thousand five hundred and twenty-two patients were taken at random. Out of this total number one thousand one hundred and forty-nine were non-presbyopes. The number of non-presbyopes in which plus was added over the standard subjective totaled 557. 48.4% of non-presbyopes had plus added by using this technique after the

standard subjective was performed. The additions in detail from an eighth of a diopter to one and a half diopters are recorded below.

Added Diopters of Plus	Number of Patients
.12	36
.25	229
.37	40
.50	155
.62	13
.75	56
1.00	23
1.25	3
1.50	2

POLICY ON CONTACT LENS FITTING AS ADOPTED BY THE INDIANA ASSOCIATION OF OPTOMETRISTS*

E. J. Cain †
South Bend, Indiana

Late in 1945 it became apparent that the public interest and demand and the profession's responsibility for satisfying them necessitated a study of the specialty of fitting contact lenses to the end that Indiana Optometry might better meet its professional obligations.

It seemed important to us that these professional obligations be met to safeguard the public from exploitation. There were two possible avenues of procedure which would insure that the public would be properly served:—

1. To rely on the legal definition of optometry in the Indiana statues to prevent the invasion of the field by insufficiently trained practitioners or
2. To supply a sufficiently well distributed group of specially trained, professional specialists.

Although the former procedure might be easier to administer, until court action became necessary, the latter policy is the only line of action for a virile profession.

To this end, a special committee consisting of Dr. E. C. Doering of Gary, Indiana, Dr. Eugene Freeman of Chicago, Illinois, and Dr. G. F. Kintner of Wabash, Indiana was given the task of studying the question in all aspects and reporting its findings. The committee's report, which follows, was accepted by the Indiana Association of Optometrists which met in convention January 20 and 21, 1946 in Indianapolis.

Until about two years ago, the use of glass or glass and plastic for contact lenses made them a tedious, difficult and often an unsatisfactory device for correcting eye defects. At that time, the development of the plastic lens was introduced and it was soon demonstrated that it corrected most of the difficulties that were formerly encountered. The plastic contact lens has now reached a state of perfection where its successful application has attained a degree where it can be prescribed with a certainty of the benefits that it will provide.

There are at the present time, two general types of contact lenses.

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† Optometrist. President, Indiana Association of Optometrists.

1. The lens that is made from a positive cast of the eye and
2. The lens that is fitted from a trial case or series of lenses of different contours and curvatures.

Both types of lenses have their exponents and this committee believes that both types may find a place for themselves or else a free interchange of experience will show which of the two is the more desirable. However, this does not mean that the contact lenses can not be prescribed with a fair degree of certainty that satisfactory results will obtained.

WHO SHALL ENGAGE IN THIS SERVICE?

After careful study it is the belief and recommendation of this committee that there must be provided in this state a sufficient distribution of well trained, professional specialists for the fitting of contact lenses.

It is essential to the welfare of the people of Indiana that there be a sufficient distribution of such specialists. This is true because there is a demand for this service and these must be provided a way of satisfying this demand that will guard against the exploitation of the public. It will be necessary for the profession actively to promote the placement of specialists, sufficiently distributed to make them readily available to every person in the state. As the demand for this service can be more readily evaluated, the density of distribution of such specialists will be controlled by economic factors.

To start with, this committee believes there should be a minimum distribution about as follows:—

It is essential that this service be rendered by a specialist. If such services are attempted to be rendered by one other than a specialist, many problems will arise which will make such efforts economically unsound and, in many cases, may jeopardize the well being of the patient.

It is necessary that the specialist be a professional man. The fitting of contact lenses demands a foundation of knowledge of the sciences such as physiology, anatomy, pathology and physics, that underlie the art of optometry, in order that the patient be properly served. There is also a high degree of professional judgment required that only a person with adequate professional training and background may possess.

The specialists must be properly trained. More will be said about this later. Suffice it to be stated here that the training of the specialist is so important that the whole future of the position of the profession in this service is most dependent on this factor.

INSURANCE

No optometrist should be without the protection of mal-practice insurance. However, no contact lens specialist should even approach a

patient without this protection. The service of fitting contact lenses can be made a wholly optometric procedure but the contact lens specialist is in such intimate contact with the eye that he must protect himself from any and all untoward events. It is the recommendation of this committee that the Department of Legislation and Law Enforcement be directed to explore the desirability of statewide protection of the members of this association by a group policy covering mal-practice insurance.

LEGAL RESTRAINTS

A brief examination of the laws lead this non-legal committee to believe that they amply cover the position of the profession in this state. However, this committee recommends that the Department of Legislation and Law enforcement, with its Counsel, be directed to study this matter and report at the next meeting of the Executive Board.

EDUCATION

This committee, recognizing the need for special knowledge and skill concerning the service of fitting contact lenses and the possible benefits to the public, recommends education along three lines:—

1. Proper training of the specialist.
2. Education of the body of the profession in the benefits to be derived from the service and the limitations of it, and
3. An educational program for the public.

At present, education of the specialist in contact lens fitting is practically confined to preceptorships held in connection with a manufacturer. Eventually, it will be necessary for the optometry schools to introduce sufficient training of all its undergraduates in the art of fitting contact lenses that they may properly advise their future patients. In addition to this survey course, a post-graduate course in fitting contact lenses must be provided by the school to keep a steady flow of specialists to the profession. These factors can not be controlled by this state alone but should be passed along to the American Optometric Association for its action.

Until the schools are ready to take up the burden of training specialists, the system of preceptorships must be used but strengthened. The two or three day course now in vogue is insufficient. The longer course for technicians is insufficient for them and is not sufficiently related to the background of optometrists. It is the recommendation of this committee that a satisfactory course in the training of optometric specialists in the fitting of contact lenses should include:—

History of fitting contact lenses.

Possible application of contact lenses, together with their limitations.

Review of the anatomy of the front segment of the eye and adnexia.
Review of the physics, optics, chemistry, physiology, pathology, and psychology involved in contact lens service.
A thorough review of those eye defects which can be helped only with contact lens service.
* Patient care
* Pre-fitting techniques
* Fitting techniques
* Modification techniques
* Post-fitting care
Legal implications
Ethics and Economics

The Department of Education should contact all of the known preceptors who are fitting contact lenses, in this vicinity, making known the desires of this Association in the training of its specialists and make known to the membership those courses which are available and considered sufficient.

The Department of Education should also be directed to inform the schools that it desires all future graduates to be given sufficient knowledge of fitting contact lenses to be acquainted with its possibilities and limitations. It should also suggest to the State Board of Examiners in Optometry that it should, at its discretion, examine prospective licensees in their ability to advise and counsel patients on contact lenses.

The Department of Education should also be directed to develop methods of training the general practitioner in optometry in a sufficient knowledge of the service rendered by contact lenses, in order that he may properly advise his patients and cooperate with the specialist for the benefit of his patient.

The Department of Public and Interprofessional Relations should develop ways and means of acquainting the public with the service of fitting contact lenses in the following matters:—

1. Description of the ways in which this service is beneficial.
2. The manner in which optometry can be of service to the people of this state.
3. The limitations of the service.

This should be done with the central idea of informing the public and not as an effort to increase the demand for contact lenses. This com-

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*These items should include a sufficient amount of supervised laboratory work on patients to give the trainee a reasonable facility in technique.

mittee strongly recommends that all such activity in educating the public should be done in a dignified and appropriate manner.

A nation-wide committee is being formed to supply a brochure covering contact lens service that can be distributed by every optometrist to his patients to help acquaint them with the facts concerning contact lenses.

ETHICS AND ECONOMICS

For the first time in optometry, the ethical considerations in the intraprofessional relationships of general practitioner-patient-specialist are coming to the front. The factors in these relationships that involve the responsibility of the general practitioner, responsibility of the specialist, the division of duties of each, criticism to be avoided, differences between optometrists, commissions, etc.—all demand a consciousness of the ethics and economics involved. This must be recognized, if the patient and the profession do not suffer.

The department of Ethics and Economics should develop such information as will be required in this regard. For the guidance of this department, the committee recommends for its consideration, the plan devised by one of its members Dr. Eugene Freeman for handling one of the most difficult problems in contact lens service—the arrangement of fees and avoidance of commissions.

The relations between the general practitioner and specialist may vary anywhere from the optometrist simply mentioning the name of the specialist to a friend or acquaintance, all the way to actual collaboration of the two on the case. In the first and nondiagnostic example, the general practitioner has no right to demand fees for services which he did not render and the specialist can never ethically split fees. In the latter case, the general practitioner has a right to expect renumeration for his services.

A division of the components of the service as it relates to a contact lens patient might be made as follows:—

a. Consultation, history, refraction, ophthalmometry, diagnosis, post-fitting refraction, rechecking optical qualities of lenses—12½% of total service.
b. Material—25% of total service.
c. Pre-fitting technique, molding, etc. (including service of anesthetist if any)—25% of total fitting.
d. Fitting and modifying material—25% of total service.
e. Optical fit of lens—grinding, polishing, checking etc.—12½% of total service.
f. Training in application, removal and care of contact lenses—5% of total service.

g. Fluid problems (not material) for one year—7½% of total service.

The general practitioner often participates in components a, e, and g. Some specialists prefer that the referring optometrist arrange to collect his own fees. Others will include those fees in the collection of the overall fee as this is the method generally preferred by the public. If there is a division of services and a consequent division of fees made between the specialist and the referring optometrist and the patient is thoroughly informed of this action—there can be no reprehension. If the payment of commissions is made by the specialist, he and the recipient are guilty of violation of the code of ethics and should be denied the cooperation and fellowship of their colleagues.

It is the duty of the profession as whole and the specialist in particular to maintain a balanced economy for the specialist. It is recommended that, as rapidly as his volume of contact lens patients permits, the specialist divorces himself from most, if not all of his practice in refraction. The ideal condition is reached when the specialist confines himself exclusively to the practice of his specialty, even to the referral of his refractive work on contact lens patients. Such action begets the confidence of his colleagues and the patients are better served.

On the other hand, the general practitioner should be free to advise the use of contact lenses in those cases where it is required and freely refer such patients to the nearest specialist. This can be done by general practitioner and ophthalmologist, if the ethical considerations are scrupulously kept.

CONTACT LENS SECTION

It has always been the experience of the professions that control of its specialties must be exercised by the body of the profession as represented by its organized association or society. It must do this to safeguard the public welfare from exploitation or insufficient service. The profession does this because its very existence depends upon its desire and ability to advance human welfare. To this end, "sections" within the association or society are formed to promote:—

1. The mutual exchange of information and new developments.
2. The validation of those who enter the specialty.

This committee recommends that at this convention there be laid the framework of a "Contact Lens Section" of the Indiana Association of Optometrists and that future conventions include the activity of this section in its program.

This committee also recommends that this association by resolution

memorialize the American Optometric Association to encourage the application of such controls of the specialty, at a national level.

CONCLUSION

This comittee, after short but intensive study of the problems involved in the service of fitting contact lenses believes that Indiana Optometry is in an excellent position for setting up a practical plan for the development and administration of the service in this state. Since the profession has only started to serve the public in this specialty, it has made few mistakes and can avoid them in the future, if close control is exercised.

With this report, the mandate of this committee has been satisfied. We have presented the problem and suggestions for activities in the various departments of the Association. We therefore finally suggest that overall direction of the specialty of fitting contact lenses be vested in the Department of Conservation of Vision.

SUMMARY

After study of the problems relating to the service of fitting contact lens this committee reports that the following recommendations are made:—

1. If the welfare of the public is to be conserved, there must be provided in this state, sufficient distribution of properly trained professional specialists to provide the service.
2. The committee suggests that the individual societies under the guidance of the Department of Organization provide proper distribution of optometric specialists in fitting contact lenses.
3. The Department of Legislation and Law Enforcement is directed to explore the possibility of a group policy covering all members of the association on mal-practice suits. The same department is directed to study the present law with respect to the service of fitting contact lenses.
4. The Department of Education should make known to the present preceptors in fitting contact lenses, the desires of this association on the type of training to be given specialists. This department should counsel with the optometry schools to include a general survey course on contact lenses in their curriculum. The same department would develop methods of educating the general practitioner in this service that he may properly and adequately advise his patients.
5. The Department of Public and Interprofession Relations is

directed to undertake a program of public education in the service that can be rendered in fitting contact lenses.

6. The Department of Ethics and Economics must instruct all optometrists in the state on the proper criteria for guidance of the relations of specialist and general practitioner.
7. This committee recommends the formation of a Contact Lens Section for the mutual interchange of information and developments among specialists and for the validation of new optometric specialists in contact lens fitting.
8. It is recommended that this committee's activities terminate with this report and that its duties be included in those of the Department for the Conservation of Vision.

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PUBLIC RELATIONS AND A STANDARD OF CONDUCT

On occasion, we hear of the bad public relations of the optometric profession. A case in point are the comments made by certain War Department medical leaders during the recent congressional hearing in Washington. These comments, incidentally, have done little to bring into a closer working focus the great bulk of optometrists and physicians who do eye work. Yet these comments may be discounted as (1) they were made during a heated controversy, and (2) they obviously do not reflect the unanimous thinking of any large segment of physicians.

The bad public relations of the optometric profession may be due to very real causes or may be due to a lack of knowledge on the part of

others as to what optometry is and how it functions. Some of our problems may stem from the fact that the profession fails at times to meet public needs, while others may be due to public ignorance of the actual constructive role the profession has been and now is playing. Optometry is not the only profession which is confronted with vexing questions. All professions have some bad public relations and wise leadership directs constant energy to correct these conditions. Professions are concerned with bad public relations problems as these are nothing more or less than an evidence of public displeasure regarding some phase of the profession's activities. In general, society insists on a high standard of conduct from professions and all professional people. This standard is maintained by social control through public opinion and through laws and also through regulations by the profession itself.

Some of the optometric profession's bad public relations are brought into being because certain optometrists refuse to conform to professional standards demanded by society. It is pleasing to note that each year this group grows numerically smaller and is less in evidence. A further trend in this direction will, in time, correct this irritation. Another problem revolves around medical-optometric relations. These, too, are being improved by adjustments in educational and technical backgrounds upon which optometric practices are based. In this latter activity, the work done by our optometric organizations, our colleges and the Optometric Extension Program is producing results.

It is well to note that the optometric profession also has good public relations. Its many professional contacts with the public have built up a vast reservoir of public good-will. Optometrists have successfully furnished such a majority of eye care, through so many generations of American life, that they are properly looked upon today as "the American Refractionist."

Moreover, optometry in general has good governmental public relations. This is evidenced by the passage of numerous optometric acts by state legislatures and also by the attitude of Congress at the recent hearings. Despite these evidences of good public relations, we must not rest in our efforts to further improve our work itself and the public's understanding of this work. We must also continue to press for constantly better standards of optometric practice. Progress has been made, but there still are maladjustments to correct. The post-war period with its many reconversion problems should prove a period of opportunity to optometry to readjust and change its professional viewpoint for the period of peace ahead.

CAREL C. KOCH

BOOK NOTICES AND REVIEWS

Books received are acknowledged by notices in this department. Special selections will be made for more extensive review in the interest of our readers as space permits.

THE PSYCHOLOGY OF SEEING. Dr. Herman F. Brandt, Director, Visual Research Laboratories, Drake University, Des Moines, Iowa. Published by Philosophical Library, Inc., 15 East 40th Street, New York, New York. 240 pages. Cloth. 1945.

Through the use of a bi-dimensional camera (invented by the author) and auxiliary testing equipment, Dr. Brandt and his associates at the Visual Research Laboratories have accumulated interesting factual data relating to behaviour of the human eye as it relates to modern living, which Dr. Brandt presents in The Psychology of Seeing. Numerous charts, pictures, graphs and tables augment the narrative facts.

Following a brief description of the equipment used to photograph the eye in motion, the author summarizes basic eye movement laws and tendencies brought out by various tests. Results of tests brought out one particularly interesting basic eye movement, i.e., the eyes have a first fixation preference for the point above and to the left of the center of the observed field. This preference would be natural for an American or English subject, as we are taught to begin reading at the upper left hand corner of a printed page. (The author mentions that the response to testing of a subject knowing no other language than Hebrew, for example, is unknown.)

However, it is the reviewer's opinion that from the advertiser's standpoint, this fact might be a more significant one, for if the knowledge that the human eye has a first fixation preference for the upper left hand corner were widely utilized by the advertising profession, it might easily lead to placing a premium on "upper left hand corner" space.

Dr. Brandt's experiments lead him into the fields of advertising, art and learning and the relation of ocular patterns to each in everyday living. It is Dr. Brandt's belief that if findings of ocular performance are practically applied, improvements can be made in quality and effectiveness of advertising; better methods of learning, and artists can gain a better insight as to what the individual response to their creations will be, and a knowledge as to what the public wants in art.

In concluding a very readable book, Dr. Brandt expresses the conviction that there is an untapped source of psychological information revealed by the ocular performance of the human eyes, and also pays

tribute to the optometrist who he says in correcting vision " . . . may well consider his work a necessary link in the whole scheme of educational effectiveness, industrial efficiency, personality development and social integration."

A. VIRGINIA HUCK

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

NEW MEMBERS OF THE ACADEMY

The following optometrists and educators have been elected to Fellowship in the American Academy of Optometry during the quarter ending December 31, 1945. The Executive Council welcomes these new members.

Dr. Ewing Adams, 1437 Farmer St., Detroit, Michigan.

Dr. E. E. Brann, 307 First National Bank Bldg., Independence, Kansas.

Dr. Charles H. Brown, 1405 Donaghey Bldg., Little Rock, Arkansas.

Dr. Charles E. Cox, 434 State St., Schenectady, New York.

Dr. Maurice M. Dalton, 200 Professional Bldg., Alhambra, California.

Lt. (j. g.) Arthur B. Emmes, H(s) USNR, Medical Unit, U. S. Naval Training Station, Newport, Rhode Island.

Dr. Isadore S. Finkelstein, 1501 Broadway, New York, New York.

Dr. Lawrence Fitch, 13 So. Chancellor St., Newton, Pennsylvania.

Dr. Russell Z. Franklin, c/o The Sheboygan Clinic, 1001 No. 8th St., Sheboygan, Wisconsin.

Dr. Lillian M. Grandmason, 714 So. Hill St., Los Angeles, California.

Dr. C. D. Jordan, 10½ So. Broadway, Peru, Indiana.

Dr. M. E. Madsen, 927½ E. Michigan, Lansing, Michigan.

Dr. William W. Royall, Jr., 133 28th St., Newport News, Virginia.

Dr. Henry G. Shane, 707 Jackson City Bank Bldg., Jackson, Michigan.

Dr. Alpheus W. Smith, Dean of Graduate School, Ohio State University, Columbus, Ohio.

Dr. James P. C. Southall, Edgewood Lane, University, Charlottesville, Virginia.

Dr. Eugene Wiseman, 232 Deleware Ave., Buffalo, New York.

ANNOUNCEMENTS

POSTGRADUATE COURSE IN CONTACT LENS FITTING AT PENN STATE

The next postgraduate course in the fitting of contact lenses will start Monday, February 25, 1946. This course will be presented at the Pennsylvania State College of Optometry at Philadelphia. The course will be of two weeks duration, and the class limited to twelve graduate students.

The first postgraduate course offered in the fitting of contact lenses was completed on November 23, 1945. The following optometrists received certificates for the successful completion of the course.

Dr. N. M. Baxter, New Bern, N. C.
Dr. T. H. Feinman, Lynchburg, Va.
Dr. J. I. Fichtner, McKeesport, Pa.
Dr. I. P. Fildermann, Memphis, Tenn.
Dr. L. B. Fleschultz, Wellsboro, Pa.
Dr. Harry I. Gross, Easton, Pa.
Dr. R. M. Heft, McKeesport, Pa.
Dr. M. Katzin, Winston-Salem, N. C.
Dr. M. A. Marvelli, Chicago, Ill.
Dr. M. H. Mack, Portland, Maine.
Dr. D. Peltan, Philadelphia, Pa.
Dr. B. Sherman, Philadelphia, Pa.

Three of the students, Drs. Feinman, Filderman and Marvelli were on terminal leave from service while Dr. Mack has just been discharged from the army.

GRANTS MADE TO THE LIONAL TOPAZ MEMORIAL LIBRARY OF VISUAL SCIENCE

The Committee for the Lional Topaz Memorial Library of Visual Science at the Ohio State University announces the receipt of a donation of $250.00 from the American Optical Company.

The Committee also announces the receipt of a donation of $136.36 from the Ohio State Board of Examiners in Optometry. This sum was contributed by Board members in appreciation of the splendid service rendered the Board by the late Dr. Ben Covert of Athens, Ohio.

These funds have been added to the permanent endowmnt of the Library in accordance with the request of the doners. The income from these funds is used for the purchase of new books and subscriptions to periodicals related to visual science.

Dr. H. W. Hofstetter is Chairman of the Committee.

POSTGRADUATE COURSES IN OPTOMETRY AT COLUMBIA UNIVERSITY

The four courses outlined below are offered primarily to meet the indicated needs of optometrists returning from military service but are open to other optometrists also. Optometry c4 will be open also to physicians, industrial psychologists, personnel directors, safety engineers, technicians and others concerned with visual problems in industry.

One or more courses may be chosen as desired, but the intensity of each course—20 day-time hours of instruction per week (with the exception of c4) plus assigned study—will permit a student to take but one course at a time. Each course will begin on the first Monday of any calendar month (from December 3, 1945) depending on a minimum registration of twelve students and will be of three weeks duration. The courses will be repeated subject to the demand. They may not be counted for credit toward any of the degrees or certificates conferred by the University. Address all applications, correspondence and requests for information to: Professor Clifford L. Treleaven, Room 407 Horace Mann Building, Columbia University, 120th Street and Broadway, New York 27, N. Y.

Optometry c1—A general review of optometric techniques and procedures. Lectures and laboratory. Fee $100. Mr. Ralph Tocher with the assistance of Messrs. John Mogey, Daniel Woolf and Harold Fisher. Beginning the first Monday of any calendar month. For optometrists.

Optometry c2—A review of the theory and practice of vision training. Lectures and laboratory. Fee $100. Mr. Daniel Woolf with the assistance of Messrs. Milton Chodruff, Elias Margaretten and Ernest Giglio. Beginning the first Monday of any calendar month. For optometrists. A course of this brevity necessarily constitutes a survey rather than a comprehensive clinical training in those special procedures employed to improve or control anomalous visual conditions.

Optometry c3—An introduction to the theory and use of contact lenses. Lectures and laboratory. Fee $100. Mr. Isidore Finkelstein with the assistance of Messrs. Harold Neuwirth, Arnold Silverstein and others. Beginning the first Monday of any calendar month. For optometrists. A course of this brevity necessarily constitutes a survey rather than a comprehensive clinical training.

Optometry c4—Visual problems in industry. Fee $50. Dr. Richard Feinberg and others. Beginning the first Monday of any calendar month. For optometrists, physicians, industrial psychologists, personnel direc-

tors, safety engineers, technicians and others concerned with visual problems in industry. A lecture course describing especially the procedures followed in examining large groups of people and the correlation of the work of the optometrist with that of the medical director, personnel director, safety engineer, production manager, etc., in an industrial organization.

Optometry c1, c2, and c3 will meet four hours daily, two sessions of two hours each, for a period of three weeks. One session daily will be in the classroom for lectures, demonstrations and group discussions, and the other in the laboratory to practice techniques under the supervision of the assistants (one assistant for each four students). In Optometry c1 the subjects will be actual patients; but in Optometry c2 and c3 this will be true to only a limited extent, the techniques being practiced mostly on fellow students. Optometry c4 is a lecture and demonstration course meeting for one two-hour session daily for three weeks. In all courses the hours are to be arranged.

ABSTRACTS

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

1. OCULAR REFRACTION

CONTACT LENSES. D. Kadesky. Eye, Ear, Nose and Throat Monthly. 1945., 24., 11., 524-527.

Kadesky presents the results obtained in prescribing contact lenses for 100 patients, 46 of which were female and 54 males. Seventy-six per cent of these patients were in the 20-40 age group. Of the total, 15 suffered from keratoconus, 7 were patients with surgical aphakia and the balance were largely myopes, some with astigmatism. In general the author found the resultant visual acuity good with contact lenses, it improving from 20/800 or less uncorrected to 20/40 and some to 20/20 with these aids to subnormal vision.

The author presents some interesting data relating to the wearing

time period experienced by these 100 patients. In this group, 2 patients were unable to wear the lenses: 12 patients could wear them but 2 hours at a time: 36 patients could wear them only 4 hours: 17 patients could wear them only 5 hours: 12 patients could wear them only 6 hours: 12 patients could wear them 8 hours: 6 patients could wear them 10 hours and 3 patients could wear them from 10 to 14 hours.

C. C. K.

CONTACT LENSES IN CORNEAL INJURY—AN ILLUSTRATIVE CASE. F. Dickinson. Dioptric Review and British Journal of Physiological Optics. 1945., New Series, 5., 1., 31-34.

The author presents a case report in which it was necessary to prescribe a contact lens for one eye only. This naturally created several problems not associated with the binocular use of these aids to subnormal vision. In this case, the patient, Dr. A. V. J., Medical Superintendent of a London hospital, consulted Dickinson as to the possibilities of a contact lens correction for his right eye. A series of corneal ulcers had reduced the visual acuity of this eye to an indefinite 6/36. Almost every causative probability had been explored, with painstaking thoroughness by medical men of repute. At the time of consultation the cornea was quiescent, but the patient regarded with natural concern the damage already present and also regarded the future with some apprehension. Due to present irregularities of the cornea the patient suffered from monocular diplopia which was a handicap in his work. After some refractive and experimental work by Dickinson it was found that the visual acuity of the right eye would improve, with a contact lens, to 6/9 + 3, and the lens was made. The patient has now used this correction for some time and reports that the monocular diplopia has disappeared and that he is again experiencing binocular vision.

C. C. K.

THE TREATMENT OF NON-PROGRESSIVE MYOPIA. L. A. Swann. Canadian Journal of Optometry. 1945, July, 86-88.

In the average non-presbyopic and non-progressive case of myopia up to 4.5 D., Swann corrects the visual acuity to 20/30 and adds to the concave correction 1 $\triangle$ prism base-in O. U., this being prescribed for general wear. This type of formula he finds, gives greater comfort for average day-to-day tasks than one which gives maximum visual acuity.

C. C. K.

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